

# Moving towards a practical and effective constraint-induced therapy protocol for chronic stroke patients: a systematic review and meta-analysis



***Presented by Dr. Pavlina Psychouli***

C. Anastasiou, Dr. I. Mamais, N. Papasalourou

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*Inspiring Change, Innovating Futures*

# Constraint Induced Movement Therapy (CIMT)

## BASIC COMPONENTS

- 1. Intensive functional practice  
(6 hrs/ day)*
- 2. Splint/ mitt*
- 3. Transfer Package (TP)*



More than 1000 research  
studies

## THE CLINICAL DILEMMA

- *CIMT original protocol is difficult to implement in routine clinical practice*
- mCIMT*
  - *less intensive training & restraint use*
  - *transfer package (TP): reduced or omitted*
- *·demonstrated superiority compared to traditional approaches*
  - *limited evidence for one, specific mCIMT protocol*



**What version of CIMT actually works in the real world?**

## OUR PREVIOUS WORK

### Categorization of mCIMT protocols for stroke patients

#### **total treatment duration:**

low (<20 hrs), moderate (21-39 hrs) or high (>40 hrs)

#### **splint-wearing time:**

low ( $\leq 3$  hrs/day), moderate (4-9 hrs/day) or high ( $\geq 10$  hrs/day)

## RESULTS

### The most frequently used mCIMT protocols

- moderate-to-low total treatment duration (*less than 39 hrs*)
- moderate-to-high restriction time (*more than 10 hrs per day*).

## STUDY AiM

*to systematically review and investigate the functional effects on upper limbs of the most widely implemented mCIMT protocols reported in the literature*



*PubMed, Scopus, EBSCO & Cochrane Library*

# STUDY SELECTION

- P** chronic stroke adults
- I** mCIMT (no more than 39 hrs of therapist-supervised training and at least 10 hrs/day of restraint)
- C** OT/ PT intervention (no combinations, no pharmaceutical treatment)
- O** upper limb motor function tests
- S** RCTs

# RESULTS

- 5 studies, total sample= 239
- 19-78 participants (mean age: 49.5-69.9 years)
- treatment duration: 2 to 8 weeks
- most frequently used outcome measures: MAL & WMFT
- follow-up measurements: 3 studies (1mo, 3mo, 6mo post-intervention)
- methodological quality (RoB2):  
3 studies= “high” risk,  
2 studies= “some concerns”

UAB Training for CI Therapy  
SID \_\_\_\_\_ Name \_\_\_\_\_ Date \_\_\_\_\_ Visit \_\_\_\_\_ Examiner \_\_\_\_\_

**Motor Activity Log (UE MAL) Score Sheet**

	<u>Amount Scale</u>	<u>How Well Scale</u>	
1. Turn on a light with a light switch	___	___	if no, why? (use code) _____ Comments _____
2. Open drawer	___	___	if no, why? (use code) _____ Comments _____
3. Remove an item of clothing from a drawer	___	___	if no, why? (use code) _____ Comments _____
4. Pick up phone	___	___	if no, why? (use code) _____ Comments _____
5. Wipe off a kitchen counter or other surface	___	___	if no, why? (use code) _____ Comments _____
6. Get out of a car <i>(includes only the movement needed to get body from sitting to standing outside of the car, once the door is open).</i>	___	___	if no, why? (use code) _____ Comments _____
7. Open refrigerator	___	___	if no, why? (use code) _____ Comments _____
8. Open a door by turning a door knob/handle	___	___	if no, why? (use code) _____ Comments _____
9. Use a TV remote control	___	___	if no, why? (use code) _____ Comments _____
10. Wash your hands <i>(includes lathering and rinsing hands; does not include turning water on and off with a faucet handle).</i>	___	___	if no, why? (use code) _____ Comments _____

<i>Task</i>	<i>Time (s)</i>	<i>Functional ability score</i>
Forearm to Table (side)	3	2
Forearm to Box (side)	5	2
Extend Elbow (side)	2	3
Extend Elbow (weight)	2	3
Hand to Table (front)	3	3
Hand to Box (front)	2	3
Weight to Box	2	3
Reach and Retrieve	1.5	3
Lift Can	7	3
Lift Pencil	120	1
Lift Paper Clip	6	2
Stack Checkers	120	1
Flip Cards	15	2
Turn Key in Lock	120	1
Fold Towel	22	2
Lift Basket	15	1

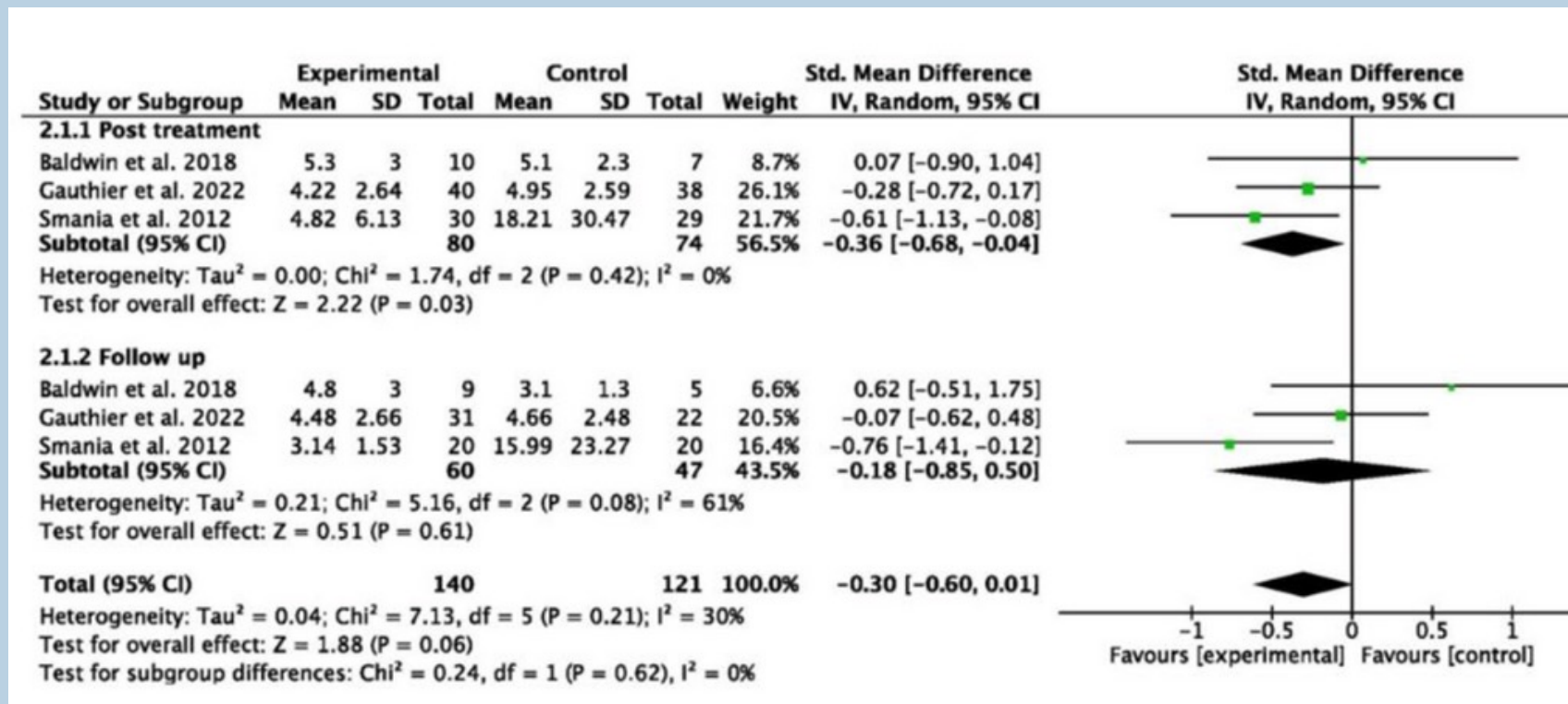
# INTERVENTION DESCRIPTION



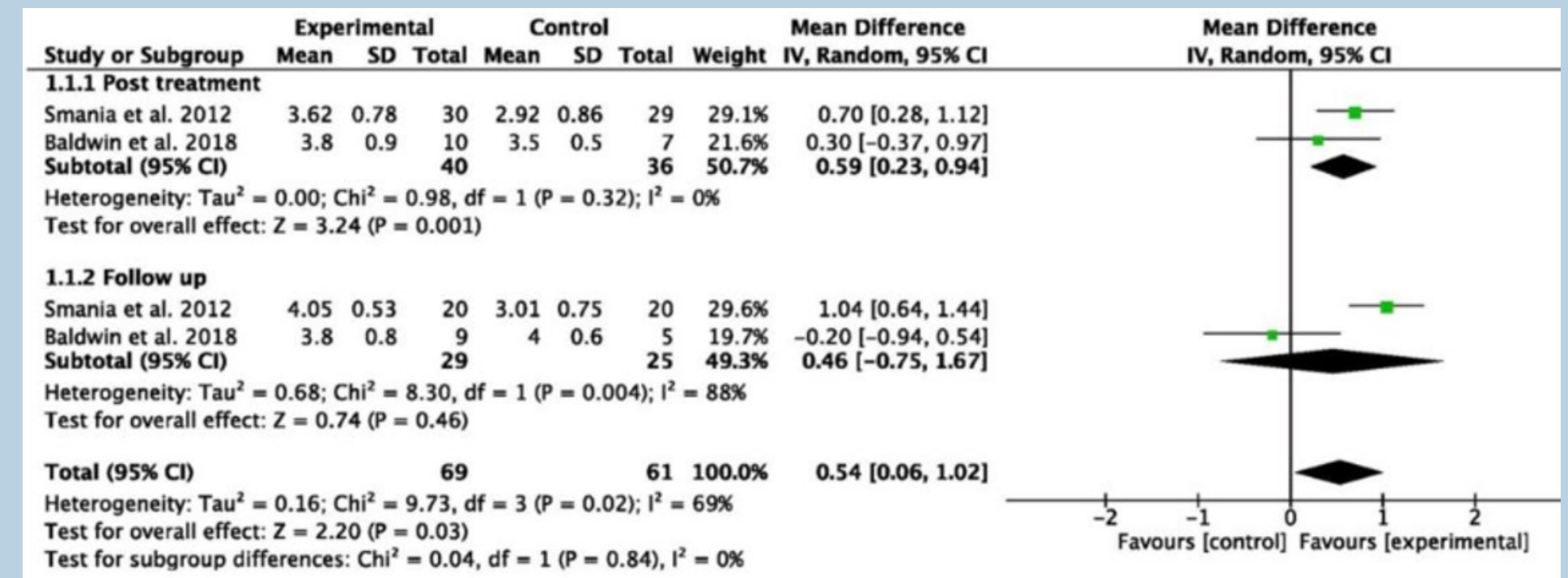
Study	mCIMT protocol
Smania et al. 2012	<p><b>Total therapist-supervised time: 10 hrs/ splint time: 120 hrs</b>  <b>5 days/ week for 2 weeks</b></p> <ul style="list-style-type: none"> <li>· 1 hour @clinic</li> <li>· Splint wearing: at least 12 hrs daily</li> <li>· 1 hr of home-based program</li> </ul>
Trinh et al. 2016	<p><b>Total therapist-supervised time: 10 hrs/ splint time: 120 hrs</b>  <b>5 days/ week for 2 weeks</b></p> <ul style="list-style-type: none"> <li>· 1 hour @clinic</li> <li>· Splint wearing: 90% of waking hours</li> <li>· No clear duration of home-based program</li> </ul>
Baldwin et al. 2018	<p><b>Total therapist-supervised time: 6 hrs/ splint time 200 hrs</b>  <b>6 sessions in 2 weeks</b></p> <ul style="list-style-type: none"> <li>· 1 hour @clinic</li> <li>· Splint wearing: 90% of waking hours</li> <li>· 42 min of home-based program</li> </ul>
Rocha et al. 2021	<p><b>Total therapist-supervised time: 24 hrs</b>  <b>3 days/ week for 8 weeks</b></p> <ul style="list-style-type: none"> <li>· 1 hour @clinic</li> <li>· No clear duration of splint time</li> <li>· No clear duration of home-based program</li> </ul>
Gauthier et al. 2022	<p><b>Total therapist-supervised time: 35 hrs/ splint time: 210 hrs</b>  <b>10 sessions in 3 weeks</b></p> <ul style="list-style-type: none"> <li>· 3.5 hrs @clinic</li> <li>· Splint wearing: 10 hrs daily</li> <li>· 5 hrs of home-based program</li> </ul>

# META-ANALYSIS

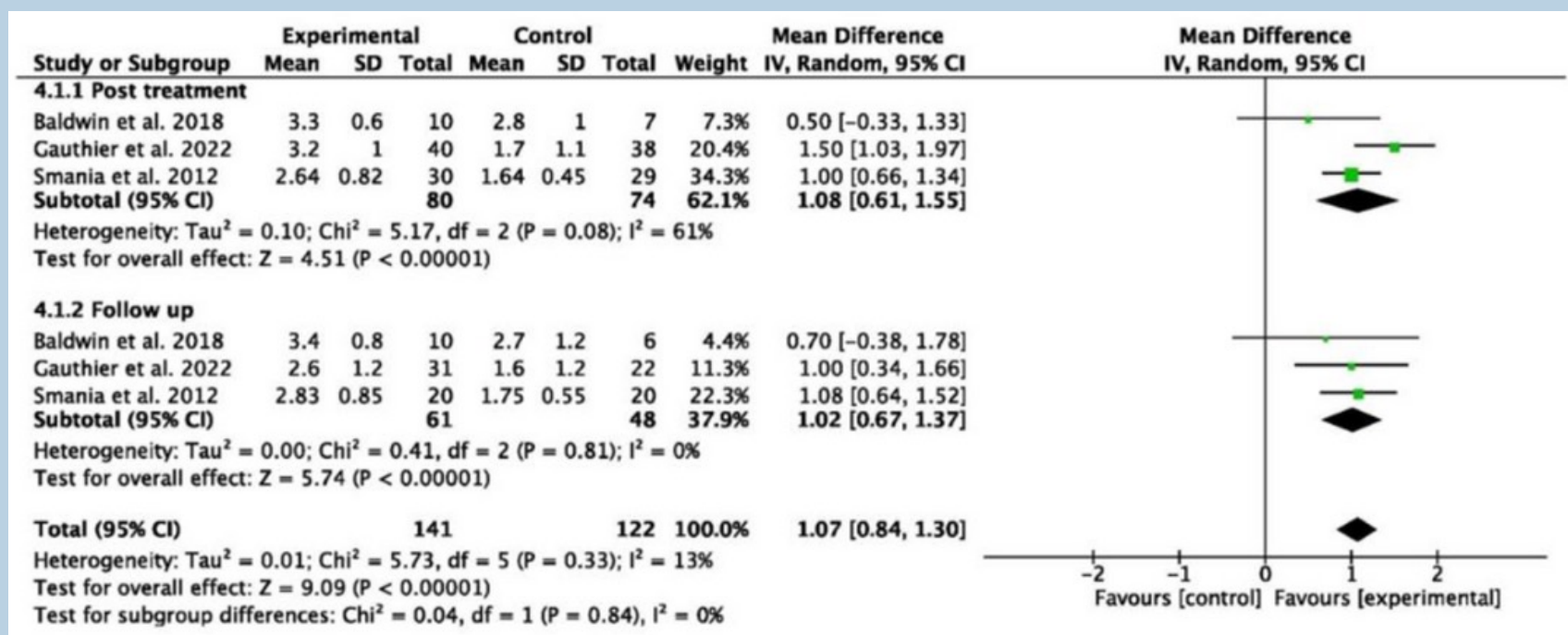
## WMFT performance time



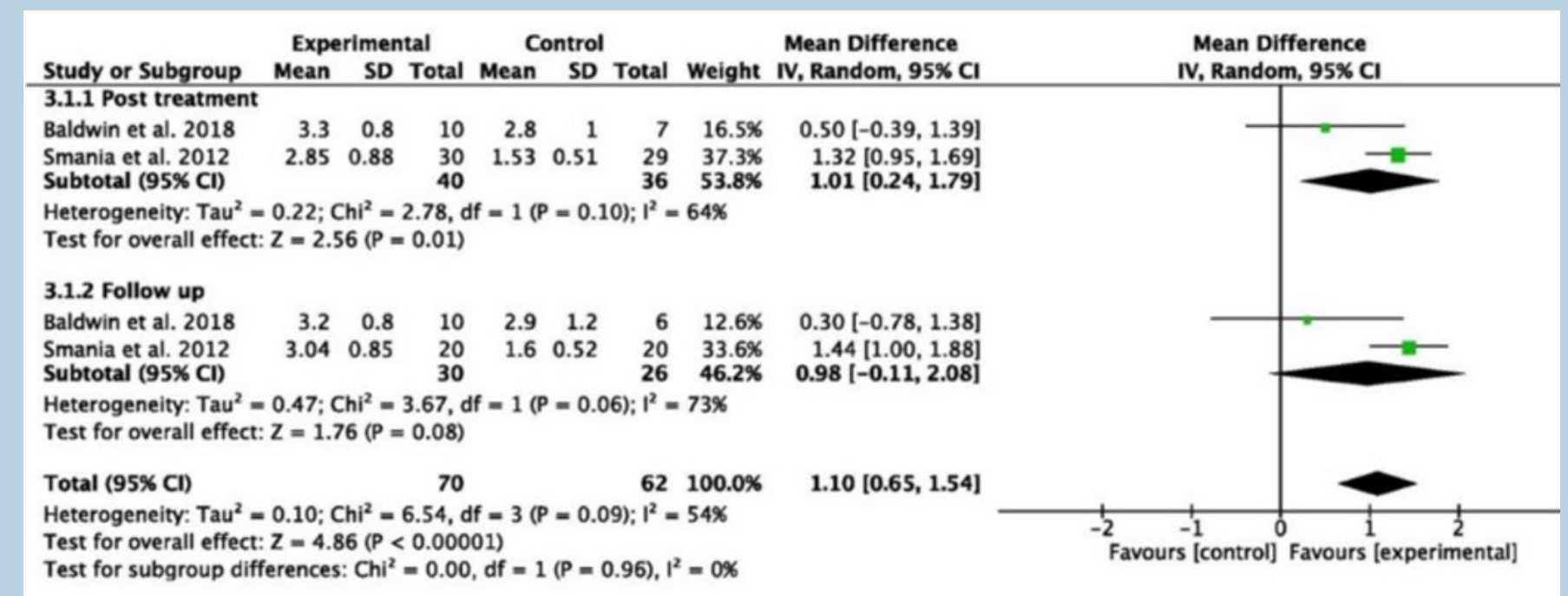
## WMFT functional ability



## MAL-QoM



## MAL-AoM



## DISCUSSION

### ***Findings in alignment with previous literature:***

- *measurable benefits even with reduced intensity schemes*
- *better MAL outcomes with a constraint of at least 6 hrs/day and 6 hrs of training/week. Daily intervention time did not lead to a significant difference in functional upper limb performance*
- *the intervention period should be at least 2 weeks, and each training session should last between 30-60 minutes/day to yield positive outcomes*

## DiSCUSSiON

### The importance of including elements of the transfer package (TP):

- Lack of TP may reduce overall effectiveness
- When elements of TP are included, the nature of the therapy shifts from an “intensity-driven” model to a “distribution-of-practice”.0 model
- Less therapist-led time, more self-directed activities in the real world
- This may explain effectiveness of mCIMT protocols with limited clinic-based training

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Thank  
you!

[P.Psychouli@euc.ac.cy](mailto:P.Psychouli@euc.ac.cy)